GAS LIGHTER

FIELD OF THE INVENTION

[0001] The present invention relates to gas lighters.

BACKGROUND OF THE INVENTION

[0002] More particularly, the invention relates to a gas lighter comprising a reservoir, to contain a fuel, the reservoir having an upper wall through which a well, and a gas-dispensing device passes, the gas-dispensing device includes at least one tubular element arranged in the well.

[0003] Generally, the tubular element of the dispensing device is installed into a well by screwing a threaded ring into a tapped upper part of the well, as depicted in Figure 1 of document WO-A01/18452. This type of fitting has the advantage in that it can be used particularly with a reservoir made of an amorphous polymer.

[0004] The above-mentioned amorphous polymers are polymers having chains of monomers disposed in disordered or random manner, unlike semi-crystalline or crystalline polymers, in which the chains are disposed uniformly. Certain amorphous polymers offer advantages for making fuel reservoirs for lighters, with particular examples worth mentioning being the categories of SANs (styrene acrylonitriles) and ABSs (acrylonitrile butadiene styrenes). Certain amorphous polymers are also transparent, which makes it possible to see the level of liquid fuel remaining in the reservoir. Amorphous polymers are also generally less expensive and easier to use than semi-crystalline polymers.

[0005] However, these amorphous polymers are relatively brittle at ambient temperature because their elongation at the elastic limit is small, generally less than 5%. Fitting the tubular element using a threaded ring creates practically no tensile stress in the wall of the well, unlike force-fitting techniques previously known, thus avoiding the appearance of microcracks through which gas may escape.

[0006] However, using a threaded ring requires the use of relatively complex molds which lengthen the de-molding operations. In addition, the operation of screwing the threaded ring into the well is a relatively difficult and lengthy process to perform in an automated manufacturing process thus increasing the time needed for assembling the lighters. These disadvantages mean that the cost of manufacture for mass production is significantly increased.

SUMMARY OF THE INVENTION

[0007] The present invention provides a gas lighter that provides a simplified fitting for the tubular element into the well, while at the same time affording a good seal, which is compatible with the use of amorphous polymers.

[0008] To this end, a lighter having a tubular element including at least one snap-fitting member designed to cooperate with a retaining element formed on the upper wall of the reservoir is provided.

[0009] By virtue of this arrangement, the tubular element and the upper wall of the reservoir preferably have relatively smooth walls and thus are easier to manufacture since the snap-fitting element does not have any screw threads.

[0010] Furthermore, fitting the dispensing device onto the reservoir is also simpler and quicker because all that is required is for the tubular element to be forced into the well until the snap-fitting member engages the retaining element.

[0011] In addition, it is optionally possible to use any of the following provisions singularly or in combination:

[0012] an annular seal is arranged between the upper wall of the reservoir in the well and the tubular element to improve sealing. More preferably, the annular seal is arranged between a radially external rim formed on the tubular element and a radially internal rim formed on the upper wall;

[0013] the tubular element has a first axial distance H_1 measured along its longitudinal axis. The first axial distance H_1 extending from the radially external rim to the point of contact of the snap-fitting members with the retaining element. The well has a second axial distance H_2 extending from the radially internal rim to the point of contact of the snap-fitting members with the retaining element. The first axial distance H_1 and the second axial distance H_2 being chosen to exert a pre-determined pressure on the annular seal which provides improved sealing without giving rise to significant tensile stresses in the wall of the well;

[0014] the retaining element is preferably formed on the lower portion of the interior face of the upper wall of the reservoir;

[0015] the snap-fitting member is preferably arranged in the lower portion of the tubular element; thus making it generally non-accessible to users who may desire, for whatever reason, to dismantle the tubular element from the lighter;

[0016] the snap-fitting member includes a tab having a nib, which is directed radially outwards and has a transverse face. The tab has an elasticity which allows the nib

to deform inwards as the tubular element is forced into the well, while permitting the nib to return to its regular position when the tubular element reaches its assembled position, thus permitting the transverse face of the nib to bear against the retaining element.

[0017] the tubular element includes an inner tube, preferably made of metal, the inner tube preferably having a microporous membrane located at the lower end of inner tube. The microporous membrane ensuring a roughly constant gas flow rate;

[0018] the upper end of the tubular element comprising a radially internal rim defining an opening through which passes an outlet duct of a valve which can move along the axis of the tubular element, thus permitting the valve to move from an at rest position, whereby preferably the valve is closed to an in-use position, whereby preferably the valve is opened. Preferably a compression spring is arranged between the radially internal rim and the valve so as to bias the valve closed;

[0019] the reservoir is preferably manufactured from an amorphous polymer. More preferably, the reservoir is manufactured from SANs or ABSs;

[0020] the tubular element is preferably manufactured from a semi-crystalline polymer.

[0021] Other features and advantages of the invention will become apparent to those skill in the art during the description which will follow, given by way of non-limiting example, with reference to the appended drawings .

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Figure 1 is a vertical cross sectional view of an embodiment of a top portion of a lighter; and

[0023] Figure 2 is a simplified vertical cross sectional view of an alternate embodiment of a gas dispensing device.

DETAILED DESCRIPTION OF THE INVENTION

[0024] In the various figures, the same references are used to designate identical or similar elements.

[0025] For purposes of promoting an understanding of the principles of the present invention, reference will now be made to an exemplary, non-limiting embodiment illustrated in Figure 1. As shown, the gas lighter **1** comprises a reservoir **2** intended to contain a fuel under pressure and, partially, in liquid phase, such as isobutene.

[0026] In the embodiment of the lighter shown, the reservoir **2** is formed of a bowl **3**, the bowl **3** preferably being U-shaped in cross section, and having a bottom wall, not visible in Figure 1, and an annular side wall that extends upwards from the bottom wall to an upper end **4**.

[0027] The upper end **4** may be closed off by an upper wall **5** which, in the example depicted, may be a separate part fixed to the bowl **3** by any method known in the art including, but not limited to bonding, gluing, welding, friction or press fit, etc. Alternatively, the upper wall **5** may be manufactured as an integral part with the bowl **3**.

[0028] The reservoir **2** is preferably manufactured from at least one rigid amorphous polymer material, including, for example, from ABSs (acrylonitrile butadiene styrenes), SANs (styrene acrylonitriles), etc. Alternatively, by way of example, the bowl **3** may be manufactured from SAN, while the upper wall **5** may be manufactured from ABS, and vice versa, it being possible, in known manner, to bond these materials together, for example by ultrasonic sealing, bonding, ultrasonic welding, gluing, etc.

[0029] As previously stated, the advantage of such amorphous polymers is that they are relatively inexpensive and easy to implement, process, manufacture, and form parts from. In addition, the amorphous polymer material, such as SAN, may be transparent, making it possible for the gas lighter user to see the level of liquid fuel remaining in the reservoir.

[0030] Other amorphous-type polymers may be used, provided that their mechanical and chemical properties are compatible with them being used as a gas lighter.

[0031] The upper wall **5** of the reservoir may further have a well **6**, that in the example shown extends along a vertical axis Z and which advantageously may be in the shape of a cylinder that is circularly symmetrical.

[0032] The well **6**, generally speaking, is capable of receiving a gas dispensing device **10** that is actuated by an operating device **11** carried by the head **12** of the lighter, which overlies the reservoir **2**. In the embodiment depicted, the head **12** preferably is retained against the upper wall **5** of the reservoir by catches **20** (*i.e.*, studs) on the head **12** that cooperate by snap-fitting or clipping with complementary catches **21** molded in the upper wall **5** of the reservoir **2**.

[0033] The head **2** may also form a support for fitting an ignition device **14** and a windshield **13**, the windshield **13** forming a screen or shield against the wind or draft.

[0034] The ignition device **14**, which are generally widely known in the art, may comprise, for example, a spark wheel **15** and a flint **16** held pressed against the spark wheel **15** by a spring **17** received in a circular cavity **18** in the head **12**. A complementary

cavity **19** is formed in the upper wall **5** of the reservoir **2** to accommodate the cavity **18** of the head **12**. However, it is of course possible to use other types of ignition devices, such as a piezoelectric device, etc.

[0035] The dispensing device **10** generally includes a tubular element **22**, which preferably is in the shape of a cylinder that is circularly symmetrical for engaging the upper wall **5** of the reservoir **2** in the well **6**. Preferably, the tubular element **22** may include an inner tube **23**, which is made of metal. The tubular element **22** preferably is made of a semicrystalline polymer such as POM (polyoxymethylene) or nylon-6,6. These semi-crystalline polymers generally have a high strength, thus permitting the inner tube **23** to be force-fitted into the tubular elements **22**, thus sealing and immobilizing the inner tube **23** in the tubular element **22**.

[0036] The lower part **24** of the inner tube **23** preferably has a regulating device for regulating the gas flow rate, which regulating device may be, for example, a microporous membrane **25**. This microporous membrane **25** preferably includes a film of polypropylene stretched uniaxially and having pores of elongate shape, as described in United States Patent Number 4,496,309. The microporous membrane **25** preferably is held against an interior shoulder **23a** of the inner tube **23**, the shoulder **23a** being formed in the vicinity of the lower end **24** of the inner tube **23**. Thus enabling the microporous membrane **25** to cover an orifice **26** formed in the center of the shoulder **23a**. The microporous membrane **25** is preferably pressed against the bottom face of the shoulder **23a** by a rigid ring **27**, which is itself retained at the bottom of the inner tube **23** by crimping the lower end **24** of the inner tube **23**.

[0037] The tubular element **22** may comprise two snap-fitting members **28, 29** designed to cooperate with a retaining element **30** to secure the tubular element **22** with the upper wall **5** of the reservoir **2** in the well **6**. Thus, the tubular element **22** and the upper wall **5** are assembled without any screw threads making the lighter particularly easy to assemble since all that is required for the tubular element **22** to engage the upper wall **5** of the reservoir **2** is for the tubular element **22** to be forced into the well **6** in between the upper wall **5** until the snap-fitting members **28, 29** engage the retaining elements **30**. Furthermore, since the tubular element **22** and the upper wall **5** of the reservoir do not have any screw threads, they can be manufactured using molds which allow higher production rates.

[0038] The snap-fitting members **28, 29** are preferably arranged in the lower portion **22a** of the tubular element **22**, thus making them generally non-accessible to users.

Thus, increasing the safety of the lighters by decreasing the likelihood that a user, for whatever reason, would dismantle the tubular element **22** from the lighter.

[0039] The retaining element **30** is preferably formed on the lower portion of the interior face **5a** of the upper wall **5** of the reservoir **2**.

[0040] It should be noted, however, that it is of course possible for the quantity of snap-fitting members to vary.

[0041] Preferably, the upper wall **5** of the reservoir **2** in the well **6** and the tubular element **22** have smooth walls which are in contact with each other over a relatively long length thus providing a proper seal between the reservoir **2** and the gas dispensing device **10**. More preferably, when the reservoir is manufactured from an amorphous polymer, such as SAN or ABS, the diameter of the tubular element **22** does not exceed the diameter of the well **6**.

[0042] To permit assembly with a pre-filled reservoir **2**, preferably, the well **6** includes a diaphragm (not shown), to reduce leakage of fuel. The diaphragm being broken upon entry of the tubular element **22** into the well **6**.

[0043] An annular seal **31** is preferably arranged between the upper wall **5** and the tubular element **22** in the well **6**. More preferably, the annular seal **31** is arranged between a radially external rim **32** formed on the tubular element **22** and a radially internal rim **33** formed on the upper wall **5**.

[0044] Furthermore, preferably the tubular element **22** has a first axial distance H_1 measured along its longitudinal axis Z. The first axial distance H_1 extending from the radially external rim **32** to the point of contact of the snap-fitting members **28, 29** with the retaining element **30**. The well **6** having a second axial distance H_2 extending from the radially internal rim **33** to the point of contact of the snap-fitting members **28, 29** with the retaining element **30**. Advantageously, the first and second distances (H_1, H_2) are chosen so that a pre-determined but not excessive pressure is exerted on the annular seal **31** thus ensuring proper sealing.

[0045] In contrast with prior art devices, which as stated above requires a threaded ring, the fitting between the tubular element **22** and the upper wall **5** allows the pressure exerted on the seal to be set more precisely.

[0046] As shown, each snap-fitting member **28, 29** generally includes a tab **35** extending from the lower end of the tubular element **22** in the longitudinal direction Z. The tab ending in a nib **36**, which is directed radially outwards and having a transverse face **37** directed towards the upper end of the tubular element **22**. The tab **35** has a radial elasticity which allows the nib **36** to deform inwards as the tubular element **22** is forced into the well

6 in between the upper wall **5**. The tab's elasticity thereafter permits the nib **36** to return to its position when the tubular element **22** reaches its assembled position, thus permitting the transverse face **37** of the nib **36** to bear against the retaining element **30**.

[0047] As best shown in Figure 2, the cross section of the tabs **35** generally forms two diametrically opposed circular arcs.

[0048] As further shown in Figure 1, the dispensing device **10** preferably includes a valve **40** having a gas outlet duct **41** opening near the ignition means **14**. The duct **41** preferably includes a shutter **42** located in the lower part of the dispensing device **10**. Preferably, the shutter **42** is made from an elastomeric material designed to shut off the gas passage orifice **26** as the duct **41** is move along the longitudinal axis Z of the tubular element **22**. Preferably, the duct **41** also contains slots **43** formed near the shutter **42** in order to provide communication with the inside of the inner tube **23**.

[0049] Furthermore, the operating device **11** includes a fork **45** mounted to tilt about a pin secured to the head **12**. The fork **45** having a first end **46** and a second end **49**. The first end **46** cooperates with a lower shoulder **47** and an upper shoulder **48** formed on the upper end of the duct **41** which emerges from the inner tube **23** thus permitting the gas dispensing device **10** to be raised as the user depresses the second end **49** of the fork **45**. When the user depresses the second end **49** of the fork **45** raising the duct **41**, the valve **40** is opened releasing gas from the reservoir **2**.

[0050] Preferably, a compression spring **50** is arranged between the underside of the second end **49** of the fork **45** and the upper wall **5** of the reservoir **2** thus biasing the fork **45** upwards and hence biasing the valve into a closed position when the lighter is not in use.

[0051] In the alternate embodiment depicted in Figure 2, the upper end **52** of the tubular element **22** may include a radially internal circular rim **53** which defines an opening **54** through which the outlet duct **41** passes. A compression spring **55** is preferably arranged between the circular rim **53** and the lower shoulder **47** of the duct **41**, so as to bias the valve closed during non-use. Similar to the operation described above, to open the valve the user simply exerts a downward force on the fork **45** (not depicted in Figure 2) causing the fork **45** to tilt so that the first end **46** of the fork **45** presses on the upper shoulder **48** of the duct **41** and lifts the duct **41**, compressing the spring **55**. When the user stops exerting the downward force on the fork **45**, the compression spring **55** causes the duct **41** to be returned to its closed position. It will be noted that in this embodiment the spring **50** placed under the second end **49** of the fork **45** is replaced by the spring **55** placed

between the circular rim **53** and the lower shoulder of the duct **41**, thus the spring **50** beneath the second end **49** of the fork **45** is no longer needed.

[0052] In this embodiment, the dispensing device **10** forms a complete assembly comprising a device for regulating the gas flow rate, which is preferably formed by the microporous membrane **25** as described above, and a valve **40** for controlling the flow rate. The valve **40** has the advantage of being naturally in its closed position thus preventing the escape of gas from the reservoir when not in use. Furthermore, since the dispensing device of this embodiment is installed as a complete assembly, this embodiment further prevents the escape of gas that may occur after the piercing of the diaphragm situated in the well **6** but before the fitting of the valve **40**. Aside from the reduction in gas losses, this embodiment also makes it possible to simplify the devices that recuperate gas on the production line.

[0053] The present invention has been described in connection with the preferred embodiments. These embodiments, however, are merely for example and the invention is not restricted thereto. It will be understood by those skilled in the art that other variations and modifications can easily be made within the scope of the invention as defined by the appended claims, thus it is only intended that the present invention be limited by the following claims.